MULTIMEDIA UNIVERSITY®

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

HBC1011 – BIOCHEMISTRY I

16 OCTOBER 2017
2:30PM – 4:30PM
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This paper consists of **4 pages** (including the front page)
2. This paper consists of **5 Short Answer Type questions.** All questions carry equal marks (10 marks per question).
3. Answer **ALL QUESTIONS.**
4. Print your answers **clearly** and **neatly** in the Answer Booklet provided.

Question 1

A. Give TWO examples of the biological importance of water. [2 marks]

B. Define pH. [1 mark]

C. What is a buffer and how does it work? [2 marks]

D. Why is water a polar molecule? [1 mark]

E. Lactic acid is present in our muscles after strenuous exercise. What is the pH of a lactic acid solution that contains 65% lactate form and 35% lactic acid undissociated form given that the K_a is 1.38×10^{-4}? [2 marks]

F. Calculate the ratio of the concentration of acetate and acetic acid required in a buffer system of pH 5.0 given than the K_a is 1.74×10^{-5}. Show the calculation. [2 marks]

Question 2

A. What types of amino residues that would be buried inside a protein structure when the protein is dissolved in lipid? Why? [2 marks]

B. Why are side chains important for protein tertiary and quaternary structures? [2 marks]

C. How do small and big protein molecules get separated in gel filtration chromatography? [2 marks]

D. Name two computational methods for protein structure visualization. [1 mark]

E. What is the difference between SDS-PAGE gel electrophoresis and 2D gel electrophoresis? [1 mark]

F. What are the purposes of using sodium dodecyl sulfate and β-mercaptoethanol for protein preparation in SDS-PAGE gel electrophoresis? [2 marks]

Continued...

Question 3

A. Amino acids that are far apart in the amino acid sequence of an enzyme can be essential for its catalytic activity. What does this suggest about its active site? [2 marks]

B. What information can you obtain about enzyme from K_m and V_{max} values? [2 marks]

C. What are the two models describing the enzyme-substrate binding? [1 mark]

D. What is a sequence alignment? [1 mark]

E. How can we study the function of a novel gene using sequence alignment? [2 marks]

F. Name one vitamin and its associated disease due to its deficiency. [1 mark]

G. Give a plausible reason for the toxicity that can be caused by overdoses of lipid-soluble vitamins. [1 mark]

Question 4

A. What chemical forces are involved in the stabilization of DNA double helix? [2 marks]

B. What is an advantage of codon degeneracy? [2 marks]

C. What does it mean to say that the DNA chain in a double helix have opposite polarity? [1 mark]

D. Name two methods used for the study of gene expression. [1 mark]

E. Name four basic components used in a typical PCR. [2 marks]

F. How is DNA fragments separated with agarose gel electrophoresis? [1 mark]

G. Ovalbumin is the major protein of egg white. The chicken ovalbumin gene contain eight exons separated by seven introns. Should ovalbumin cDNA or genomic DNA be used to form the protein in *E. coli*? Why? [1 mark]

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Question 5

A. List two reasons why carbohydrates are considered important molecules. [2 marks]

B. Why are all monosaccharides and disaccharides soluble in water? [1 mark]

C. What is the function of the carbohydrate moiety that is attached to erythropoietin? [1 mark]

D. What is the difference between transporter and channel in passive transport? [2 marks]

E. Why do some cooking oils, such as canola and olive oil, become rancid sooner than solid shortening? [2 marks]

F. Suggest a reason why animals that live in cold climates tend to have higher proportions of polyunsaturated fatty acid residues in their lipids than do animals that live in warm climates. [1 mark]

G. Suggest a reason why inorganic ions, such as K^+, Na^+, Ca^{2+} and Mg^{2+}, do not cross biological membrane by simple diffusion. [1 mark]

End of paper